

Metropolitan Transportation Management Center

A CASE STUDY

Milwaukee MONITOR



**Addressing Congestion While
Improving Safety and Air Quality**

October 1999

Foreword

Dear Reader,

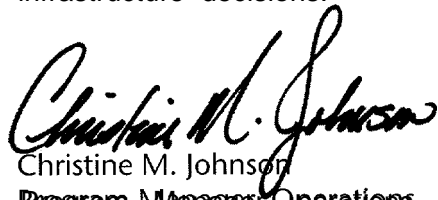
We have scanned the country and brought together the collective wisdom and expertise of transportation professionals implementing Intelligent Transportation Systems (ITS) projects across the United States. This information will prove helpful as you set out to plan, design, and deploy ITS in your communities.

This document is one in a series of products designed to help you provide ITS solutions that meet your local and regional transportation needs. We have developed a variety of formats to communicate with people at various levels within your organization and among your community stakeholders:

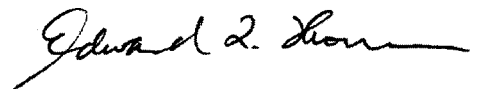
- **Benefits Brochures** let experienced community leaders explain in their own words how specific ITS technologies have benefited their areas;
- **Cross-Cutting Studies** examine various ITS approaches that can be taken to meet your community's goals;
- **Case Studies** provide in-depth coverage of specific approaches taken in real-life communities across the United States; and
- **Implementation Guides** serve as "how to" manuals to assist your project staff in the technical details of implementing ITS.

ITS has matured to the point that you don't have to go it alone. We have gained experience and are committed to providing our state and local partners with the knowledge they need to lead their communities into the next century.

The inside back cover contains details on the documents in this series, as well as sources to obtain additional information. We hope you find these documents useful tools for making important transportation infrastructure decisions.



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NOTICE

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The following case study provides a snapshot of metro Milwaukee’s MONITOR transportation management center. It follows the outline provided in the companion document, *Metropolitan Transportation Management Center Concepts of Operation — A Cross Cutting Study*, which describes operations and management successful practices and lessons learned from eight transportation management centers in the United States and Canada.

This case study reflects information gathered from interviews and observations at the MONITOR transportation management center. The authors appreciate the cooperation and support of the Wisconsin Department of Transportation and its partners in the development of this document.

Preface

<i>Background</i>	2
<i>Design and Implemen ta tion</i>	3
<i>Operations</i>	5
<i>Maintenance</i>	6

Contents

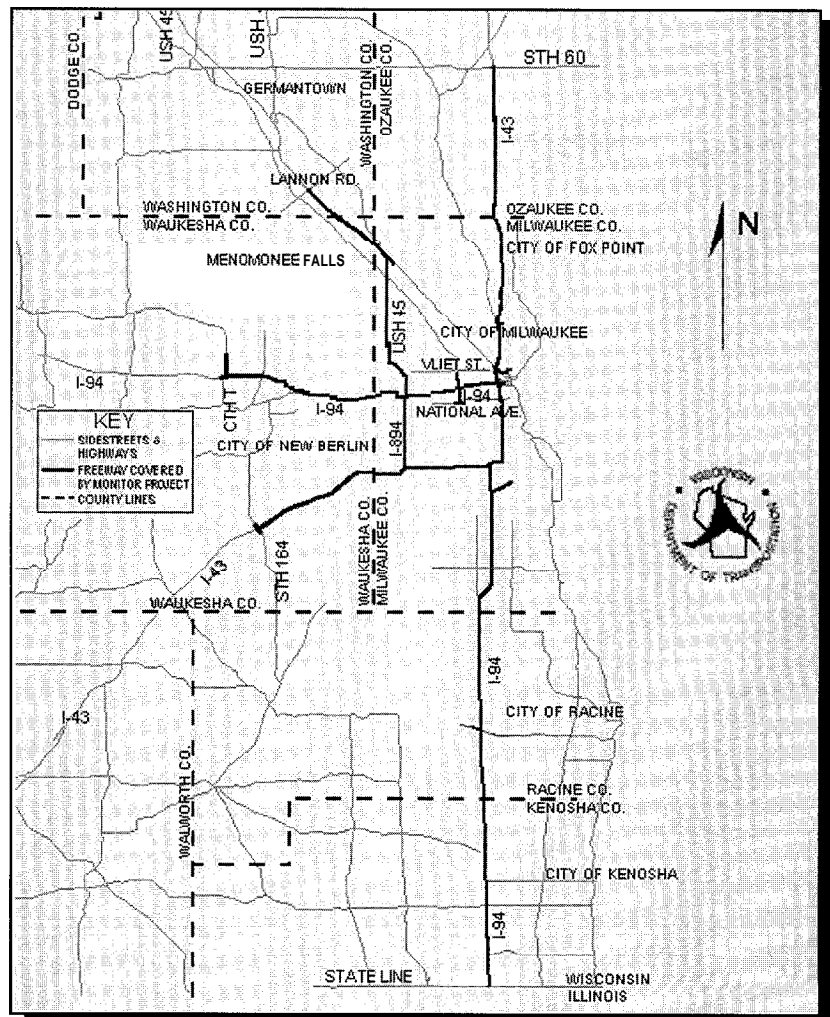
Background

MONITOR is the freeway traffic management system for metropolitan Milwaukee and continues to expand, covering an area beyond Milwaukee. The area freeways were planned in 1961, but the network was never completed. Although the road network provides potential diversion routes, there is no outer belt freeway, so commercial vehicle traffic travels through town. The regional planning commission recommended traffic management as early as 1978 due to congestion problems on, and incident vulnerability of, the existing freeway system. The initial major MONITOR deployment was to support traffic during rehabilitation of I-94, the East-West freeway.

The primary objectives of MONITOR are to:

- Address congestion
- Improve safety and air quality.

Causes of congestion are evenly split between recurring and incident-related traffic, including special events and construction. Nonrecurring congestion is expected to grow by 70 percent. In the metropolitan area I-94 experiences more than 100 crashes per mile per year, and much of the remainder of the freeway network has 50 to 100 crashes per mile per year.

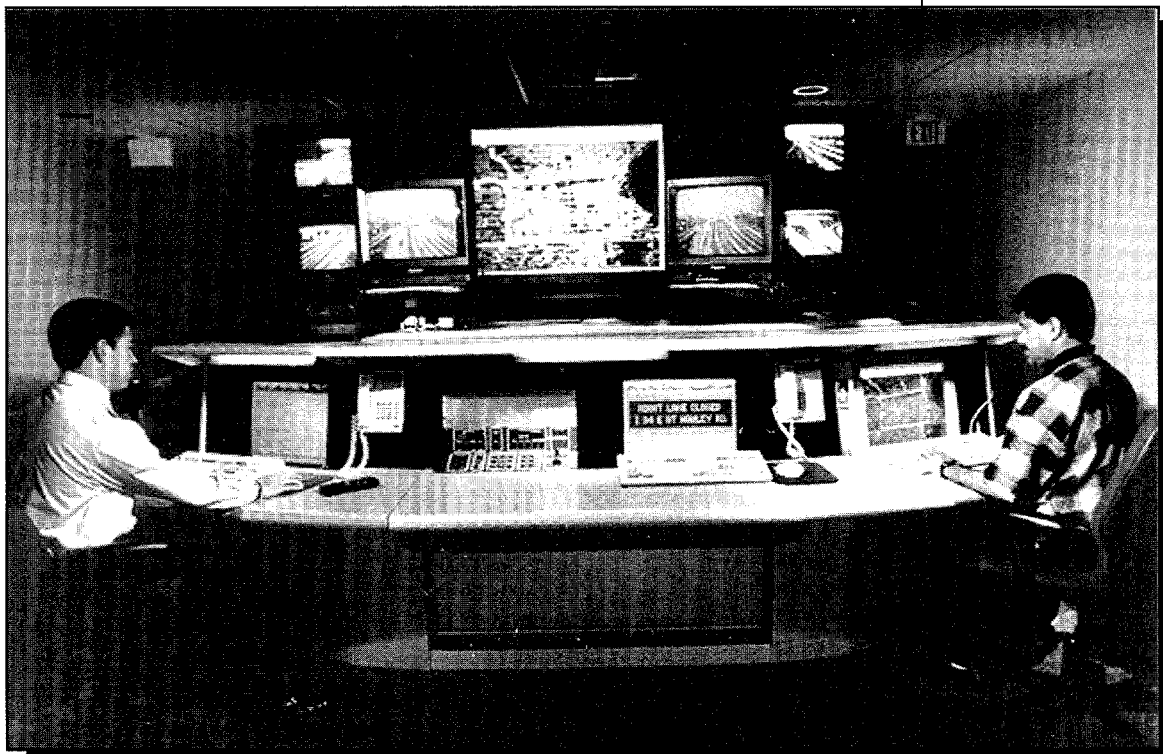


Design and Implementation

General system design parameters for the MONITOR are:

- MONITOR uses loop pairs in every lane at 1/3–1/2 mile average intervals on the mainlanes and single loops on ramps. It also uses closed-circuit television at 1 -mile increments, traffic responsive ramp metering with high-occupancy vehicle priority, freeway and arterial variable message signs, and highway advisory radio.
- The TMC occupies 6,500 square feet (increasing soon to 10,000 square feet) on the 12th floor of a downtown office building with indirect access to the freeway system. It contains a single row of consoles with three operator positions and four video monitors. The front of the control room includes four 20-inch video monitors and a 60-inch rear projection unit. (The picture below shows MONITOR's previous set up that has since been upgraded.) The facility also houses WisDOT MONITOR design, inspection, and maintenance personnel.
- The TMC is a leased facility. Many of the physical plant improvements have been performed to WisDOT specifications by the leaseholder.

MONITOR employs students from two nearby Universities—this provides valuable practical experience while MONITOR benefits from inexpensive and flexible labor resources.



Design and Implementation

Method of Implementation

- WisDOT employed consultants to design the field systems, which were then procured under conventional low-bid construction contracts. The computer system was designed, developed, and implemented by a consultant, based on another system that the consultant had completed. WisDOT is now investigating the replacement of its computer system, using separate design, oversight, and development consultants. WisDOT personnel are involved extensively in all design and deployment efforts for system expansion and upgrading.

Testing

- No major system upgrades have been performed, although the server and workstation operating systems have been updated. Archived data are available for testing.
- A plan for operations readiness testing of the suggested replacement system is being considered.
- No system test environment is maintained. Instead, testing is performed outside of core operations hours. System changes that successfully complete the testing period are then added to the system.
- Testing can be performed using either archived data or a “test data feed” provided by the original development contractor.

Training

- WisDOT has developed guidelines and procedures for system operation and other operations training material. A training manual has been developed for the on site law enforcement representative. New staff receive about 2 weeks of initial training. Training materials are kept current by temporary student staff. There are also classes on system administration and variable message sign control.
- Training for maintenance personnel is procured through commercially available courses and from vendors.

Documentation

- The initial design consultant/system developer provided extensive system and equipment documentation and initial training material for the computer system and control room equipment. Documentation on field equipment has been procured as part of the relevant construction contracts.
- Relevant documents include system “as-builts,” a system design report, a system administration manual, system operations and reference manuals, and a changeable message signs guide,
- Documentation is maintained by WisDOT. Student labor has also been applied successfully to updating operations and system documentation.
- The system does not provide a Help function.

Operations

- The system is operated in two shifts, incorporating the a.m. and p.m. peaks. Each shift includes a permanent operator and at least one student operator. An additional student operator is on duty during mid-day off-peak periods with permanent operators available to assist. System startup is accomplished each morning by maintenance staff that verify operational status of the equipment. The system will not allow an operator to log out if the operator has devices active or an incident under management; a shift-transfer function is available.
- A dedicated liaison (captain rank) with the county sheriff is stationed at the TMC and paid for by WisDOT. This individual supports control room operations. Control room staff are provided a sheriff's department radio tuned to the traffic frequency, and also have a scanner monitoring highway maintenance and other relevant agencies.
- A majority of incidents are detected by monitoring congestion levels on the area map, through calls from the sheriff (who receives 911 calls), and calls from the enhanced service patrol. Variable message sign messages are input manually and monitored by a "reminder" system function. Camera control is through a keypad/joystick separate from the workstations.
- The system monitors 63 centerline miles of freeway, with 25 additional miles due to come online in 1999 and 15 more in 2000 for a total target of 130 centerline miles, including 130 ramp meters, 75 closed-circuit cameras, and 30 variable message signs.
- Coordination with emergency services and the service patrol is through the on site sheriff's department liaison.
- Transit integration with traffic management has been identified as a need for the greater Milwaukee area. Discussions to date center on sharing of traffic information and video, and on providing real time transit information from the Milwaukee County Transit automatic vehicle location system to patrons online. Funding has been identified, but further action is awaiting completion of Y2K activity.
- Because of the proximity of the key personnel, no special arrangements are necessary for conflict resolution. The TMC manager is available on-site.
- Based on recent experience with area flooding, emergency situation planning is being considered.
- WisDOT staff gather information on all construction and lane closures and fax this to a wide variety of users weekly. Real-time updates are provided by radio or phone.

Workload and Performance

MONITOR benefited from a variety of perspectives by locating ITS planning, design, construction, and operations and maintenance personnel in the TMC.

Coordination

Conflict Resolution

Nonstandard Operations

Maintenance

Fault Detection and Correction

- The system indicates faults of some devices by changing the device icon color on the system map. A maintenance database into which problems are entered and resolution tracked has been developed by WisDOT and is used extensively in tracking equipment status and reliability. Faults are also reported by WisDOT personnel and law enforcement.

Configuration Management

- The system has received many minor fixes and a few internally added functions, but no major system upgrades. No configuration management tool or baseline was provided by the system design or implementation contractors.

Logistics

- Software development and system maintenance tools have been procured directly by WisDOT. WisDOT is considering a software maintenance contract for its next generation system. WisDOT procures spares required for maintenance activity through purchase orders.

Maintenance

- Two years of maintenance was bid into the initial installation contract. At its expiration, field equipment maintenance was separated into variable message signs and “all others,” and bid as purchase order type contracts. Communications maintenance is provided by the network provider. WisDOT provides spares for maintenance. The maintenance contractor is responsible for coordination with active warranties.
- WisDOT staff maintain control room equipment. A program of continuing upgrade and replacement of computer equipment is in place.
- WisDOT is considering an increase in maintenance contractor staffing to improve preventive maintenance coverage.

MONITOR serves as a source for information on and authorization of road closures throughout the region.

For further information, contact:

Federal Highway Administration Resource Centers

Eastern Resource Center
10 S. Howard Street, Suite 4000 – HRA-EA
Baltimore, MD 21201
Telephone 410-962-0093

Midwestern Resource Center
19900 Governors Highway
Suite 301 – HRA-MW
Olympia Fields, IL 60461-1021
Telephone 708-283-3510

Southern Resource Center
61 Forsyth Street, SW
Suite 17T26 – HRA-SO
Atlanta, GA 30303-3104
Telephone 404-562-3570

Western Resource Center
201 Mission Street
Suite 2100 – HRA-WE
San Francisco, CA 94105
Telephone 415-744-3102

Federal Transit Administration Regional Offices

Region 1
Volpe National Transportation Systems Center
Kendall Square
55 Broadway, Suite 920
Cambridge, MA 02142-1093
Telephone 617-494-2055

Region 6
819 Taylor Street
Room 8A36
Fort Worth, TX 76102
Telephone 817-978-0550

Region 2
1 Bolling Green
Room 429
New York, NY 10004
Telephone 212-668-2170

Region 7
6301 Rockhill Road, Suite 303
Kansas City, MO 64131-1117
Telephone 816-523-0204

Region 3
1760 Market Street, Suite 500
Philadelphia, PA 19103-4124
Telephone 215-656-7100

Region 8
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216 1 6th Street, Suite 650
Denver, CO 80202-5120
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Atlanta, GA 30303-3104
Telephone 404-562-3500

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San Francisco, CA 94105-1831
Telephone 415-744-3133

Region 5
200 West Adams Street
24th Floor, Suite 2410
Chicago, IL 60606-5232
Telephone 312-353-2789

Region 10
Jackson Federal Building
915 Second Avenue, Suite 3142
Seattle, WA 98174-1002
Telephone 206-220-7954

Notes

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ADDRESS ITS ISSUES PERTINENT TO A VARIETY OF AUDIENCES**

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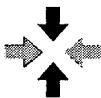
Products Available in This Series:



- **Benefits Brochures** quote how ITS technologies have benefited specific areas



- **Technical Reports** include results from various Field Operation Tests.



- **Cross Cutting Studies** present current data from related ITS applications



- **Implementation Guides** assist project staff in the technical details of implementing ITS



- **Case Studies** provide in-depth coverage of ITS applications in specific projects.

ITS Topics Addressed in This Series:

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www.its.dot.gov*

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ITS Cooperative Deployment Network (ICDN):

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ITS Electronic Document Library (EDL):

<http://www.its.fhwa.dot.gov/cyberdocs/welcome.htm>

ITS Professional Capacity Building Program Catalogue:

<http://www.its.dot.gov/pcb/98catalg.htm>

Federal Transit Administration:

<http://www.fta.dot.gov>

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